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(54) Cover for a storage battery

(57) A cover (A) for a monoblock storage battery is provided on its reverse side with an exhaust passage (6) which is common to a plurality of cell chambers (2) and which is defined by mutually facing walls (4). The passage (6) is closed by closure plate (9). The cover has baffle walls (8) disposed adjacent to ventilation openings (5) in the walls (4) so as to leave gaps (7). These gaps (7) are closed by a wall (not shown) for preventing gas generated in the cells of the battery from flowing directly through the openings (5), thereby reducing the loss of electrolyte from the battery during use.

FIG.1(A)

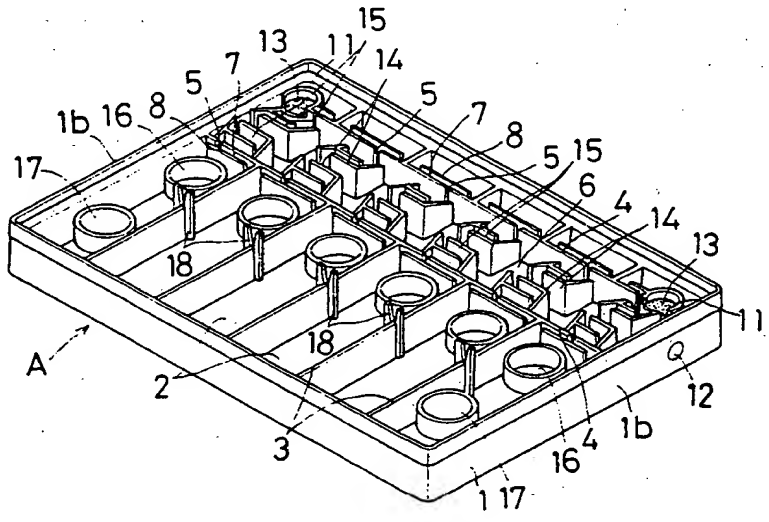

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FIG. 1(A)

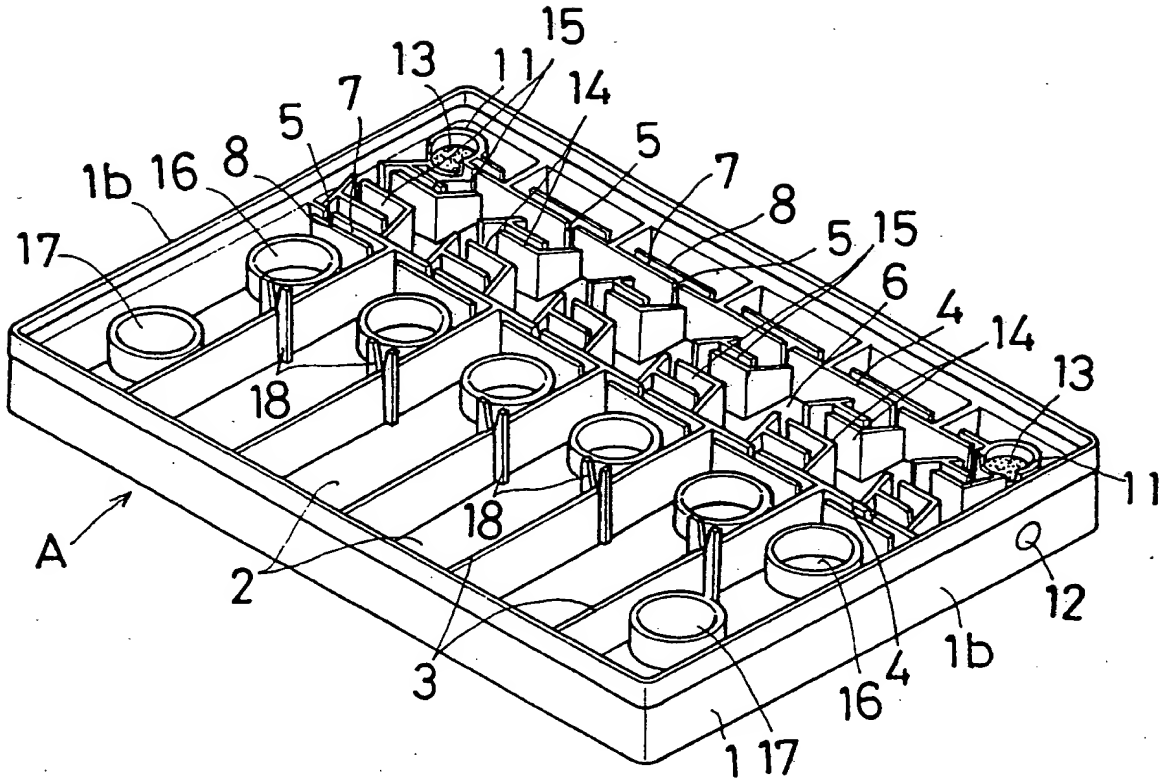

15
13
11
14
7
5
1b
16
8
17
18
A
2
3
18
5
7
8
5
15
6
4
14
13
11
12
1b
4
16
1
17

FIG. 1(B)

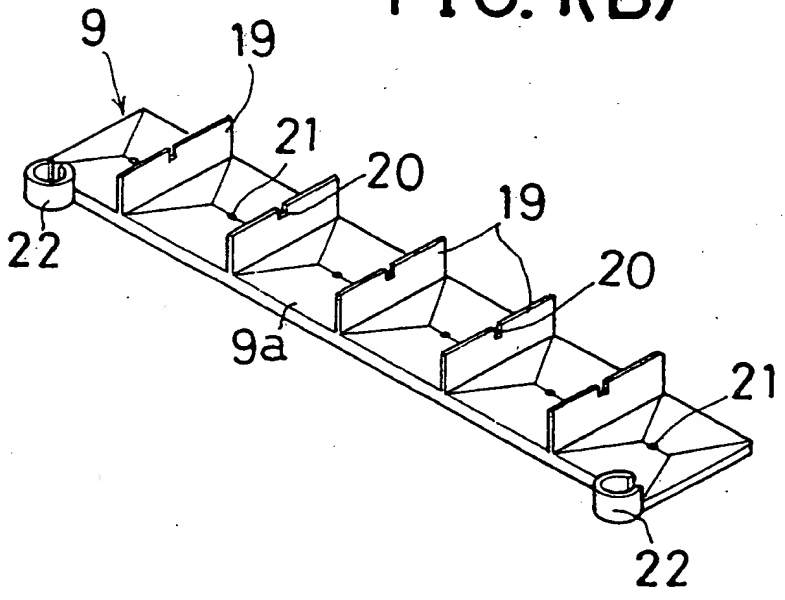

9
19
21
20
22
19
20
9a
21
22

FIG. 2

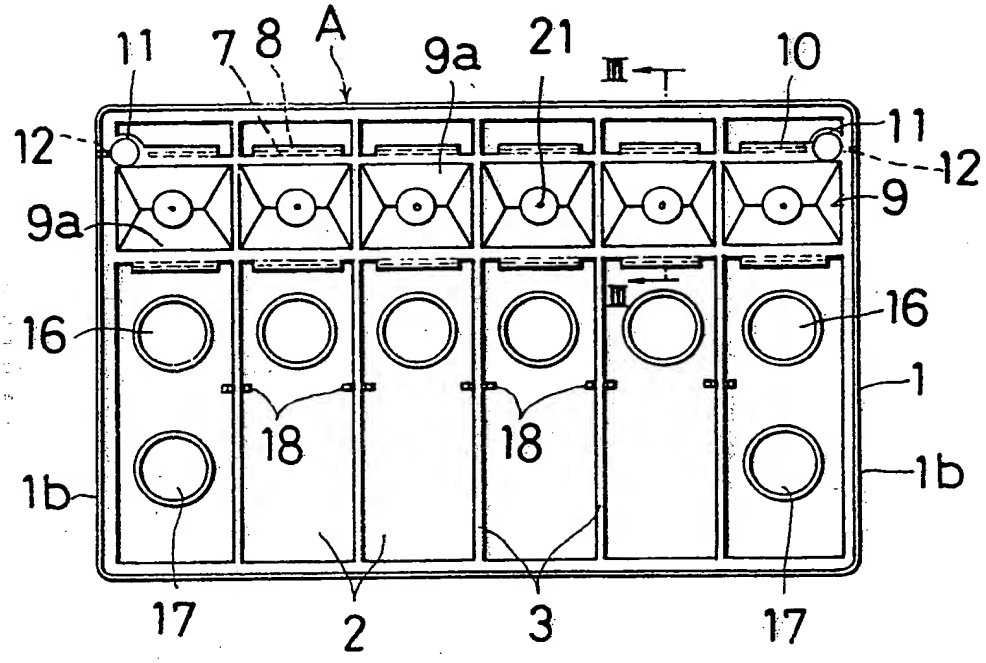


FIG. 3

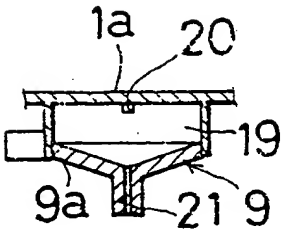
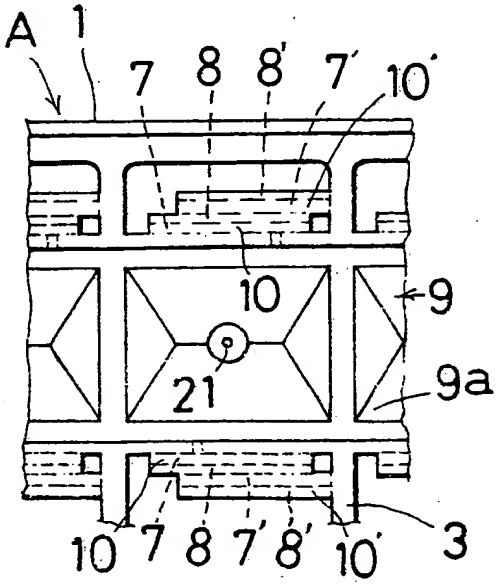


FIG. 4



SPECIFICATION

Cover for a storage battery

This invention relates to a cover for a storage battery, the cover having an exhaust passage common to a plurality of cell chambers of the battery.

A conventional battery cover of the above type has a top wall provided with openings for allowing communication between the cell chambers and the exterior. A channel-shaped exhaust passage is provided on the outer surface thereof. This cover has the disadvantage that electrolyte leakage to the outer surface of the cover may take place. For overcoming this disadvantage, we have previously proposed a cover provided on its reverse surface with mutually facing walls extending across a plurality of cell chambers so as to form an exhaust passage common to the cell chambers. This proposed cover is constructed, as disclosed in Japanese Unexamined Publication No. 144747/1977, so that openings made in the facing walls to allow communication between the passage and the cell chambers are open at their lower surfaces. Accordingly, this cover has the disadvantage that, when it is fitted to a battery container, gas containing electrolyte mist rising from the cell chambers in the battery container, is discharged immediately through the openings, and thus a decrease in the amount of electrolyte in the cells takes place comparatively easily and over a short period of time.

According to the present invention, there is provided a cover for a storage battery, the cover being provided on its reverse surface with mutually facing walls extending across cell partition walls partitioning the interior of the cover into a plurality of cell chambers, at least one of the facing walls being provided with ventilation openings each corresponding to a respective cell chamber, the space between the facing walls forming a common exhaust passage which is in communication with each cell chamber through a respective ventilation opening, baffle walls being provided outside the openings so as to leave respective gaps therebetween, and the cover having a first closure plate which covers the lower surface of the common exhaust passage and second closure plates which cover the lower surfaces of the gaps.

It is of course possible for the first and second closure plates to be a single integral plate or to be several individual plates.

The cover of this invention can be made by a method in which there is prepared a moulded cover comprising a case-shaped cover plate, a plurality of cell partition walls provided on the reverse surface of the cover plate for partitioning the interior thereof into a plurality of cell chambers, facing walls extending across these partition walls, ventilation openings in at least one of the facing walls and corresponding to the respective cell chambers, a common exhaust passage which is defined by the facing walls and is in communication with the cell chambers through the respective openings, and baffle walls so provided outside the respective openings as to leave respective gaps therebetween. A moulded closure plate which is prepared separately and is common to the respective cell chambers is mounted in the common exhaust passage. Thereafter, by means of a heating plate, the peripheral edge of the moulded closure plate and the peripheral edge of the common exhaust passage are fused together by heating to adhere together in a liquid-tight manner, and at the same time the lower edge of the facing wall and the lower edge of the respective baffle wall on the outside thereof are fused together by heating for forming a closure plate on the lower surfaces of the gaps.

If this method is carried out by making use of a heating plate which is used in a conventional process of heating fusion adhesion of a cover to a battery container, this is advantageous in that a monoblock storage battery can be obtained immediately upon manufacture of the cover of the invention.

For a better understanding of the invention, reference will now be made, by way of example, to the accompanying drawings in which:

Figures 1A and *1B* are exploded perspective views of a cover of the invention;

Figure 2 is a view from below of the cover shown in Figures 1A and 1B;

Figure 3 is a sectional view taken along line III-III in Figure 2; and

Figure 4 is a view from below of a portion of another cover of the invention.

Referring to Figure 1A, there is shown a moulded cover *A* made of a thermoplastic synthetic resin such as polypropylene. The cover *A* has a case-shaped cover plate 1 formed of a top wall 1*a* (Figure 3) and a rectangular peripheral side wall 1*b* extending downwards from the periphery thereof, a plurality of parallel partition walls projecting from the reverse surface of the cover plate 1 and partitioning its interior hollow space into a plurality of cell chambers 2, and mutually facing walls 4 extending across these partition walls 3 and defining an exhaust passage 6. The facing walls 4 are provided with slit-shaped ventilation openings 5 corresponding to the respective cell chambers 2, and, in addition, baffle walls 8 are provided adjacent to openings 4 so as to form gaps 7. Thus, the exhaust passage 6 is in communication with the respective cell chambers 2 through the respective ventilation openings 5, and accordingly the passage 6 forms an exhaust passage common to all of the cell chambers 2.

Additionally, the cover *A* is provided on its reverse surface with tubular vents 11 formed by deforming outwards one of the facing walls 4 at each end of the exhaust passage 6, these tubular vents 11 being in communication with the atmosphere through small openings 12 through the side wall 1*b* of the cover plate 1. The tubular vents 11 contain respective gas filters 13. Additionally, pairs of baffles 14 are provided in the exhaust passage 6 on the reverse surface of the cover *A* and adjacent to ventilation openings 5, so as to form detour passages 15 for gas.

The cover has openings 16 in the top wall 1*a*, each corresponding to a cell chamber, for filling the cells of the battery. The cover also has openings for an

electrode through each to the two end chambers. The cover also has pairs of projections 18 for guiding the partition walls of the battery.

Figure 1B shows a moulded closure plate 9 made of thermoplastic synthetic resin such as polypropylene which is to be fitted in the exhaust passage 6 so as to be in contact with the internal surfaces of the facing walls 4 for closing the lower surface of the exhaust passage 6 of the cover *A*. The reverse surface of the closure plate 9 is provided, at positions in alignment with the respective cell partition walls 3, with a plurality of projecting walls 19 which, when the plate 9 is fitted in the passage 6, abut the reverse surface of the top wall 1*a* and ensure that the outer surface of the plate 9 is positioned in the same horizontal plane as the cell partition walls 3. The walls 19 can serve as baffles within the exhaust passage. The abutment edges of the projecting walls 19 are provided with small cut-out openings 20 for gas ventilation. Additionally, the closure plate 9 may be provided, at positions corresponding to the cell chambers 2, with respective electrolyte return-flow holes 21. The portion of plate 9 surrounding each hole 21 is formed into a funnel-shaped inclined wall 9*a* centred on the return-flow hole 21. Furthermore, tubular vents 22, which fit in the tubular vents 11 at the time of mounting the closure plate 9 in the passage 6, are formed on the plate by moulding, so that the gas filters 13 in the tubular vents 11 are supported from below by the vents 22.

After fitting the closure plate 9 in the passage 6 of the cover *A* such that the plate 9 covers the lower surface of the passage, the resultant cover is fixed in a liquid-tight manner to a battery container (not illustrated) to produce a liquid-tight monoblock battery. This fixing is effected by a known process, e.g. by using a heating plate which is fused and thereafter pressing the cover and container together to form a liquid-tight joint.

It is preferable to use such a conventional heat sealing process to form a liquid-tight seal between the closure plate 9 and the cover *A* and to form a covering wall 10 for covering the lower surface of the gaps 7. Thus, by using the heating plate, such portions of the cover *A* that are to be in abutment with the upper surface of the battery container (i.e. peripheral edge and the partition walls 3 thereof) are fused by heating by a known process. At that time, such transverse portions of the closure plate 9 that are in alignment with the respective partition walls 3 are also fused by heating. According to this method, in addition thereto, by means of the heating plate, the peripheral edge 9*a* of the closure plate 9, the walls 4 (including the tubular vents 11) surrounding the peripheral edge 9*a* and the baffle walls 9 are fused, by heating whereby, as shown in Figure 2, the closure plate 9 is connected in a liquid-tight manner to the surrounding portion thereof and at the same time there is formed a covering wall 10 which extends therebetween for closing the lower surface of the slit-shaped ventilation openings 5 and the lower surface of the gaps 7. It is of course possible for at least one of the facing wall 4 and the baffle wall 8 to have a height or thickness sufficient to form by fusion the covering wall 10. It is usual and is preferable that, after completion of the foregoing joining by fusion, the resultant cover is immediately brought into pressure contact with the battery container to form the monoblock battery.

In use of the cover, the covering wall 10 prevents the gas generated in the cell chambers of the battery from passing directly to the slit-shaped opening 5, so that the gas must go around the covering wall 10, i.e. must flow through the gap 7 from both ends thereof. Consequently, during the travel of the gas, electrolyte mist in the gas is removed effectively. In addition, the gas passing through the slit opening 5 impinges against the baffles 14 and thereafter is discharged from the small vent openings 12 at each end, after passing through the gas filters 13. During this travel, liquid mist is again removed. The liquid mist caught by the baffles 14 is returned to the interior of the cell chambers 2 through the return-flow openings 21 of the closure plate 9. The projecting walls 19 of the closure plate 9 can serve also as partition walls for returning most of the liquid mist discharged from one cell chamber 2 to the same cell chamber. The opening 21 is so small in diameter that a film of the returning liquid is formed therein to close it so as to prevent the gas from entering from the outside.

As shown in Figure 4, at least one additional baffle wall 8' may be provided so as to leave at least one additional gap 7' between the baffle wall 8' and the baffle wall 8 and at least one additional covering wall 10' is provided on the lower surface of the gap 7', whereby the mist catching function is further improved.

CLAIMS

1. A cover for a storage battery, the cover being provided on its reverse surface with mutually facing walls extending across cell partition walls partitioning the interior of the cover into a plurality of cell chambers, at least one of the facing walls being provided with ventilation openings each corresponding to a respective cell chamber, the space between the facing walls forming a common exhaust passage which is in communication with each cell chamber through a respective ventilation opening, baffle walls being provided outside the openings so as to leave respective gaps therebetween, and the cover having a first closure plate which covers the lower surface of the common exhaust passage and second closure plates which cover the lower surfaces of the gaps.

2. A cover as claimed in claim 1, the periphery of the first closure plate having been joined to the periphery of the exhaust passage by the use of a fusible heating plate, and the second closure plates having been formed by fusing together the lower edge of a respective baffle and the lower edge of the adjacent portion of the facing wall.

3. A cover as claimed in claim 1 or 2, the exhaust passage having therein baffles associated with each ventilation opening, which baffles form passages through which gas passing through the respective ventilation opening must pass to reach the exhaust passage.

4. A cover as claimed in any of claims 1 to 3, wherein the exhaust passage has partition walls in alignment with the cell partition walls, the partition walls of the exhaust passage having openings therein.

5. A cover as claimed in any of claims 1 to 4, wherein the first closure plate has therein openings which, in use, enable electrolyte collected in the exhaust passage to return to the battery.

6. A cover as claimed in any of claims 1 to 5, having further baffle walls disposed adjacent to said first-mentioned baffle walls so that the further gaps are left therebetween, the lower surface of these further gaps being closed by closure plates.

7. A cover for a storage battery, substantially as hereinbefore described with reference to, and as shown in, Figures 1(A), 1(B), 2 and 3 of the accompanying drawings or Figures 1(A), 1(B), 2 and 3 of the accompanying drawings as modified by Figure 4 of the accompanying drawings.

8. A storage battery provided with a cover as claimed in any of claims 1 to 7.

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